DOCUMENT TYPE: Product User Manual

TITLE:

O3M SAF

Offline UV Product User Manual

	FUNCTION	NAME	DATE	SIGNATURE
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CHECKED BY				
APPROVED BY				

DOCUMENT IDENTIFICATION	WBS Nr	KEYWORDS
SAF/O3M/FMI/PUM/001		user manual, format, umarf

DOCUMENT STATUS SHEET

Issue	Date	Modified Items / Reason for Change
1.0	15.11.2006	Initial revision of the full document
1.1	04.05.2007	-moved algorithm description and error analysis to a separate ATBD as required by EUMETSAT -updated the file naming convention
1.2	04.04.2008	- added error fields
1.3	12.02.2009	- clarified the setting of quality flags in section 3.2.; table 3 in section 5.1.2.; tables 7 and 8 in section 5.1.4.

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1. INTRODUCTION

1.1 Purpose and scope

This document is the user manual of the O3M SAF Offline UV product (OUV). It includes the definition of the product format. The algorithm and error analysis are described in a separate Algorithm Theoretical Basis Document [RD1].

1.2 Acronyms

ATBD	Algorithm Theoretical Basis Document
AVHRR	Advanced Very High Resolution Radiometer
CIE	Commission Internationale de l'Éclairage, International Commission on Illumination.
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
GOME-2	Global Ozone Monitoring Experiment, version 2
HDF	Hierarchial Data Format
O3M SAF	Satellite Application Facility on Ozone and Atmospheric Chemistry Monitoring
UMARF	Unified Meteorological Archiving and Retrieval Facility

1.3 References

1.3.1 Applicable Documents

[AD1] UMARF to SAFs ICD, EUM/UMA/ICD/004, Issue 3.13, 14 Feb 2007.

[AD2] UMARF SAF Metadata Definition, EUM/UMA/TEN/030, Issue 1.7, 09 Feb 2007.

1.3.2 Reference Documents

[RD1] OUV Algorithm Theoretical Basis Document, SAF/O3M/FMI/ATBD/001, Issue 1.2, 15.9.2008.

[RD2] McKinlay A.F and Diffey B.L., *CIE Research Note*, 6(1), 1987

[RD3] Setlow R.B., *Proc. Nat. Acad. Sci. USA.*, 71, 3363-3366, 1974.

[RD4] Caldwell, M.M. “Solar UV Irradiation and the Growth and Development of Higher Plants”, pages 131-177 in Giese A.G (ed.) *Photophysiology*, vol 6. Academic Press

[RD5] Gruijl F.R. and Van der Leun J.C., *Health Phys.*, 67(4), 319-325, 1994

[RD6] Kinne S. (2007): Towards an observation-tied AOD climatology, presentation in AT2 Aerosol Workshop, Bremen, June 2007.

[RD7] Tanskanen, A., (2004) Lambertian surface albedo climatology at 360 nm from TOMS data using moving time-window technique. Proc. XX Quadrennial Ozone Symposium, 1-8 June, Kos, Greece., pp 1159-1160.

[RD8] HDF5 File Format Specification, http://hdf.ncsa.uiuc.edu/HDF5/

2. PRODUCT OVERVIEW

The O3M SAF offline surface UV product is derived from the measurements of the operational polar orbiting Metop and NOAA satellites. The product contains the most important quantities of the Sun's radiation that can be harmful to life and materials on the Earth. These quantities include daily doses and maximum dose rates of integrated UV-B and UV-A radiation together with values obtained by different biological weighting functions, solar noon UV index and quality control flags. The product is calculated in a 0.5 degree regular grid and stored in a HDF5 file. The contents of the product file are listed in chapter 5. An example of the daily erythemal dose product is shown in figure 1 below.

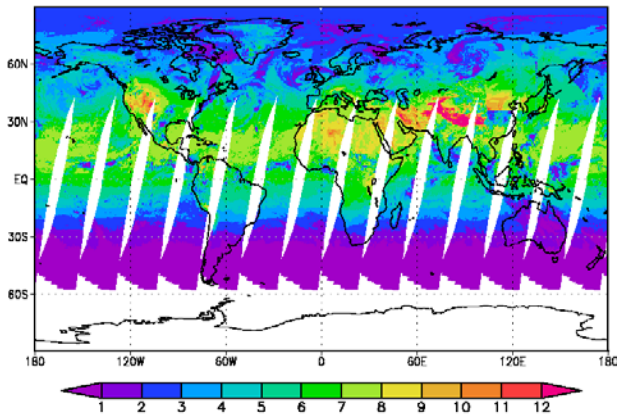

Figure 1. An example product field. Erythemal (CIE) daily dose [kJ/m^2] on 20 June 2007. The global coverage is limited by the swath of GOME-2 instrument, leaving stripes at low latitudes. The polar night and large solar zenith angles limit the coverage at the winter pole.

The biological weighting functions (also known as action spectra) model responses of different biological entities to UV radiation. The currently applied functions are plotted in Figure 2 and a short description of their meaning is given in Table 1.

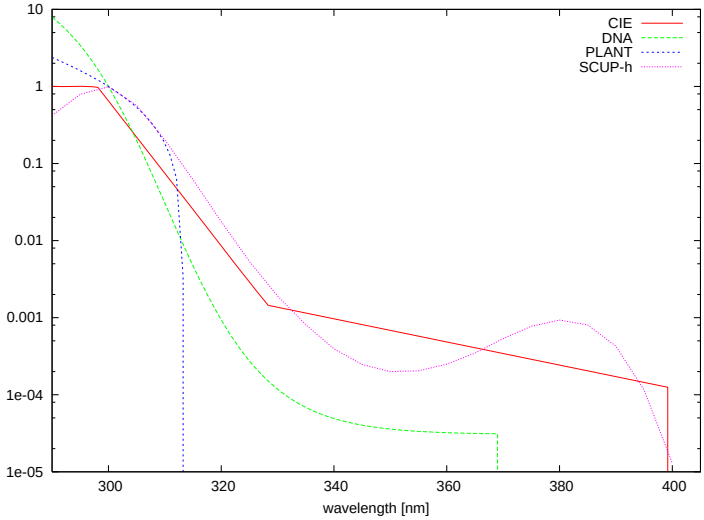

Figure 2. The biological weighting functions (table 1) used in the OUV product: CIE (red), DNA (green), Plant (blue) and SCUP-h (purple).

Table 1. Description of the biological weighting functions used in the OUV product.

Weighting function	Ref.	Description
CIE	[RD2]	Most often used weighting function. It is also known as the erythemal weighting function, because it measures the reddening of the skin due to sunburn.
DNA	[RD3]	Measures the ability of UV irradiance to cause damage to unprotected DNA. Normalization to 1.0 at 300 nm is used (normalization to 265 nm is divided by 0.0326)
Plant	[RD4]	Measures the generalized response of plants to UV irradiance. Normalization to 1.0 at 300 nm is used (normalization to 280 nm is divided by 0.2176)
SCUP-h	[RD5]	Skin Cancer Utrecht-Philadelphia action spectrum, adjusted for human skin. Measures the incidence of skin cancer (squamous cell carcinoma in human skin, SCC).

The key factors affecting the surface UV radiation are ozone, clouds, aerosols and surface albedo. The sources of these key factors are described below.

The total ozone is obtained from the O3M SAF near real time total column ozone product (NTO). This product is made by German Aerospace Center (DLR) and disseminated via the EUMETCast broadcasting system. It is derived from the measurements of the GOME-2 instrument onboard Metop satellites.

The cloud optical depth is estimated from AVHRR channel 1 (visible) reflectances. AVHRR is also onboard the Metop satellites. The sampling of the diurnal cloud cycle is improved by using additional AVHRR data from the NOAA satellites, available through the data exchange between EUMETSAT and NOAA. Because Metop is on a morning orbit and NOAA satellite on the afternoon orbit, at least two samples of the diurnal cycle can be obtained globally (Figure 3). More overpasses are available at high latitudes where the instrument swaths overlap for consecutive orbits. This sampling scheme provides a sufficient compromise between the global coverage and sampling of the diurnal cycle. Moreover, the processing data flow can be kept relatively simple because both the Metop and NOAA AVHRR data are available through EUMETCast.

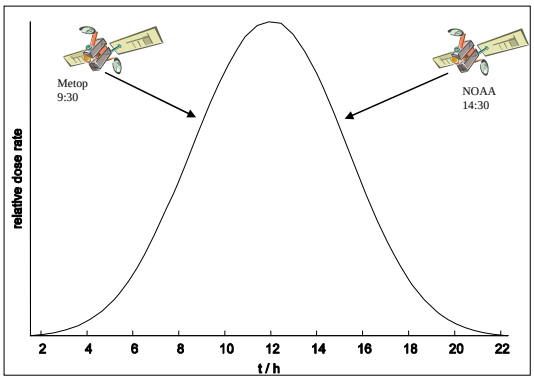

Figure 3. The diurnal cycle of UV dose rate (clear-sky case shown for clarity) together with the sampling achieved by Metop and NOAA AVHRR measurements. The sampling of the diurnal cycle is improved at high latitudes where the instrument swaths overlap for consecutive orbits.

The aerosol optical depth is currently taken from climatology [RD6], and the surface albedo from the climatology of Tanskanen [RD7].

3. PRODUCT QUALITY

3.1 Expected Accuracy and Validation

The target product accuracy is 20 % against ground-based UV measurements. The surface UV product is validated by a validation service. This service, also located at FMI, performs two different validation activities. Firstly, online quality checks are made within the first 30 days of product processing to detect possible degradation of the product quality. These quality checks are performed with preliminary ground-based reference data. Secondly, the UV product is fully validated against quality-checked ground-based measurements. These results are provided as half-yearly validation reports. These validation reports will be available on the O3M SAF web site at http://o3msaf.fmi.fi.

3.2 Quality Flags

Quality flags (table 7 in section 5.1.4) are set during the processing to indicate degraded product quality. Figure 4 shows example plots of the quality flags. These quality flags should be carefully examined when using the product. In order to simplify basic quality control, three summary flags (table 8 in section 5.1.4) have been designed: QC_MISSING, QC_LOW_QUALITY and QC_MEDIUM_QUALITY. The user is encouraged to use these summary flags as follows:

- If no quality checking is wanted, then the data with QC_MISSING equal to 1 should be discarded. This is equally achived by checking for fill values in the data.
- Good and slightly degraded data are obtained by discarding data with QC_LOW_QUALITY equal to 1
- Good data are obtained by discarding all data with QC_MEDIUM equal to 1.

The quality flagging procedure will be refined based on the feedback from the validation reports, and therefore the mapping in table 8 may change in the future.

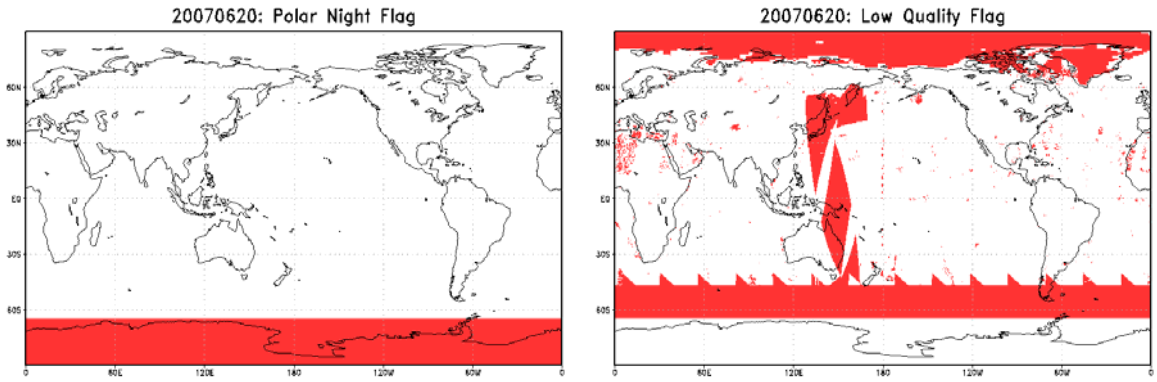

Figure 4. Example plots of the quality flags. The red color indicates where the flag is on. (left) The polar night flag is set when the solar zenith angle is larger than 88 degrees and (right) the low quality flag is set when it is larger than 70 degrees. The low quality flag is also set for other conditions, such as ice sheets, other areas with high surface albedo and areas where not insufficient cloud data were available

3.3 Current Quality Issues

The estimation of effective cloud optical depth from the AVHRR reflectances becomes prone to errors if the solar zenith angle is larger than 70 degrees or if the surface albedo is high, and therefore the corresponding product values are flagged as of low quality. The product values are also flagged if insufficient cloud data were available for the calculation of the diurnal integral.

Climatological values are currently used for surface albedo and aerosols. The surface albedo climatology fails during snow falling and melting periods, which vary from year to year. The aerosol climatology, on the other hand, tends to underestimate the aerosol loading in the boundary layer, especially during the summer time.

4. PROCESSING, ARCHIVING AND DISSEMINATION

4.1 Processing and Archiving

The offline UV product is produced operatively with a maximum delay of 15 days between the satellite measurements and the dissemination to the users. The actual delay depends on the operational computing environment and on possible delays in getting the input data from different sources. The overall processing scheme is described below.

The input near real time total column ozone product (NTO) is produced by the German Aerospace Center (DLR). It is sent to the EUMETCast uplink station at Usingen, Germany, where it is broadcasted via telecommunication satellites (Hot Bird). The NTO product is received at FMI, together with input AVHRR level 1b products both from MetOp and NOAA satellites.

The output OUV product is stored in the FMI Archive, from where it can be accessed via the Unified Meteorological Archive and Retrieval Facility (UMARF) at EUMETSAT. The processing data flow is depited in figure 5 below.

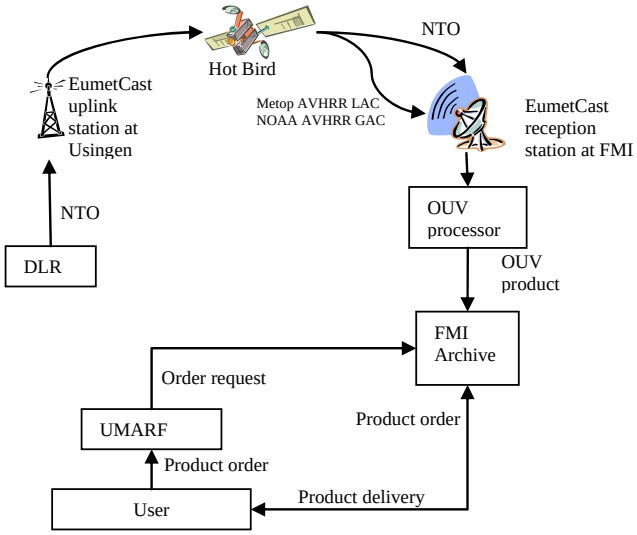

Figure 5. Overall processing data flow.

4.2 Product Ordering

After the integration of SAF products to the EUMETSAT Unified Meteorological Archive and Retrieval Facility (UMARF), the HDF5 files can be ordered from UMARF at http://archive.eumetsat.int/umarf. The product order will be transmitted to the FMI Archive, and the user will receive an e-mail containing the instructions on how to download the data files.

4.3 User Services

The helpdesk can be accessed through the O3M SAF web site at http://o3msaf.fmi.fi, or by by sending e-mail to o3msaf@fmi.fi.

5. PRODUCT FILE FORMAT

This section describes the HDF5 format [RD8] of the offline UV product.

5.1 File Structure

The data in the HDF5 file is organized under four groups: METADATA, PRODUCT_SPECIFIC_METADATA, GRID_DESCRIPTION and GRID_PRODUCT. The file structure is shown in Figure 6. The values in all groups are either copied from the input data or calculated by the processor.

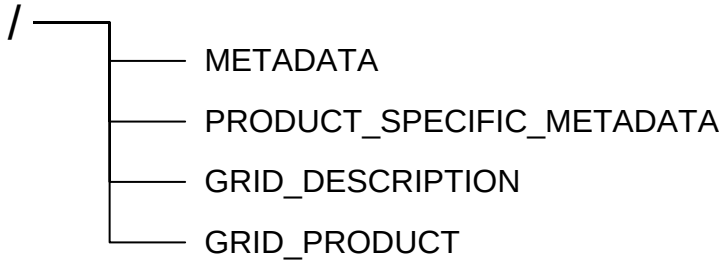

Figure 6. Structure of the HDF5 file.

The METADATA group contains the parameters required by UMARF [AD1] [AD2] while the PRODUCT_SPECIFIC_METADATA group is used for additional information specific to this product. The product fields are stored in a regular longitude-latitude grid. The grid parameters are stored as attributes of the GRID_DESCRIPTION group whereas the product fields are stored as datasets in the GRID_PRODUCT group. The x-dimension of the grid is the longitude and the y-dimension is the latitude. The product fields are two-dimensional arrays of floating point or integer data. If a value for a grid cell cannot be calculated, a fill value is written to the array. Each array has five attributes: Title, Unit, FillValue, ValidRangeMin and ValidRangeMax. These are used to describe the contents of the array. The organization of the data is illustrated in Figure 7.

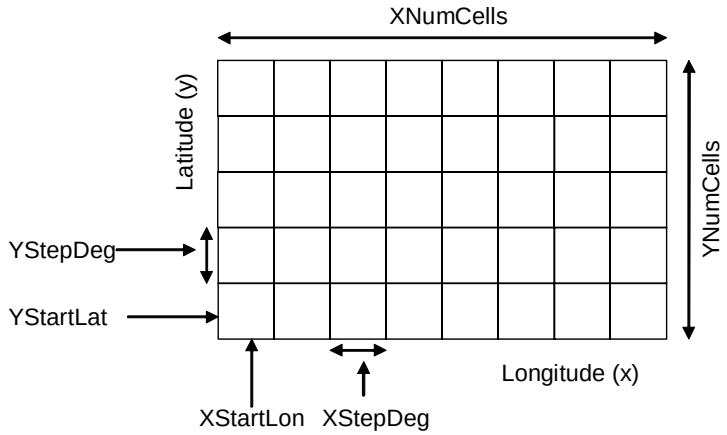

Figure 7. Organization of the product fields in the HDF5 file.

5.1.1 METADATA Group

The content of the METADATA group is shown in the following table. All parameters are stored as attributes of the group. The allowed values for the parameters that are required by UMARF are consistent with the requirements given in [AD2]. The allowed values given in *italics* mean any value of the given type (e.g. *string* means that the attribute can contain any string, within the UMARF size limit).

Table 2. METADATA group contents.

Attribute name	Data Type	Description	Allowed values
SatelliteID	string	Platform identifier (mission and spacecraft the product originated from).	M01,M02,M03, N15,N16,N17,N18 , N19 etc.
OrbitType	string	Orbit type of the spacecraft, indicating the coverage of the product.	LEO
InstrumentID	string	Instrument which acquired the product.	GOME,AVHR
SensingStartTime	string	UTC date and time at acquisition start of the product.	YYYY-MM-DDThh:mm:ss.ddd
SensingEndTime	string	UTC date and time at acquisition end of the product.	YYYY-MM-DDThh:mm:ss.ddd
ProcessingCentre	string	Centre that generated the data.	O3FMI
ProcessingLevel	string	Processing level applied for generation of the product.	03
ProcessingMode	string	Processing mode applied for generation of the product	N=Nominal, B=Backlogged, R=Reprocessed, V=Validation
ProcessingTime	string	UTC date and time at processing end of the product.	YYYY-MM-DDThh:mm:ss.ddd
ReferenceTime	string	Time at which the product is defined to be valid.	Same value as ProcessingTime
ProductAlgorithmVersion	string	Version of the algorithm that produced the product.	*String<4>*
ParentProducts	string	A list of the name of the parent products, upon which the product is based.	NTO, AVHRR_level_1b
BaseAlgorithmVersion	string	Version of the NTO product.	*String<4>*
ProductType	string	Abbreviated name for the product type, or rather product category.	O3MOUV
ProductFormatVersion	string	Version number of the product format (= Issue of this User Manual document)	*String<4>*
OverallQualityFlag	string	Overall quality flag for the product.	OK or NOK
QualityInformation	string	Several miscellaneous quality indicators for the product.	*String<511>*

Attribute name	Data Type	Description	Allowed values
DegradedRecordCount	int	Number of degraded product values.	*Int*
DegradedRecordPercentage	int	Percentage of degraded product values.	*Int* 0 – 100
MissingDataCount	int	Number of missing product values.	*Int*
MissingDataPercentage	int	Missing data percentage.	*Int* 0 – 100
GranuleType	string	Type description of the item.	DP
MapProjection	string	Projection used by the product	Geographic
DispositionMode	string	Disposition mode applied for generation of the product	O = Operational, P = Pre-operational

5.1.2 PRODUCT_SPECIFIC_METADATA Group

The product specific metadata are listed in the following table.

Table 3. PRODUCT_SPECIFIC_METADATA group contents.

Attribute name	Data type	Unit	Description
LowSunNoonSza	float	degree	Limiting solar noon zenith angle for setting the QC_LOW_SUN quality flag.
PolarNightNoonSza	float	degree	Limiting solar noon zenith angle for setting the QC_POLAR_NIGHT quality flag.
ThickCloudsCod	float	none	Limiting cloud optical depth for setting the QC_THICK_CLOUDS quality flag.
HighAlbedoClearSky	float	none	Limiting surface albedo for setting the QC_HIGHALB_CLEARSKY quality flag.
HighAlbedoClearSkyPatm	float	atm	Limiting surface pressure for setting the QC_HIGHALB_CLEARSKY quality flag.
InhomogeneousSurfaceHeightLimit	float	m	Limiting surface height deviation for setting the QC_INHOMG_SURFACE quality flag.
InhomogeneousSurfaceAlbedoLimit	float	none	Limiting surface albedo deviation for setting the QC_INHOMG_SURFACE quality flag.

5.1.3 GRID_DESCRIPTION Group

The grid parameters are stored as attributes of the GRID_DESCRIPTION group. The attributes are given in the following table.

Table 4. GRID_DESCRIPTION group contents.

Attribute name	Data type	Unit	Description
XNumCells	int	N/A	Number of grid cells in the X direction
YNumCells	int	N/A	Number of grid cells in the Y direction
XStartLon	float	degree	Longitude of the centre of the first grid cell in the X direction. Longitude ranges from -180 to +180.
YStartLat	float	degree	Latitude of the centre of the first gird cell in the Y direction. Latitude ranges from -90 to +90.
XStepDeg	float	degree	Step (increment) between the grid cells in the X direction
YStepDeg	float	degree	Step (increment) between the grid cells in the Y direction

5.1.4 GRID_PRODUCT Group

The datasets in the GRID_PRODUCT group are given in the following table. The daily doses, daily maximum dose rates and their error estimates are stored for the following four different biological weightings: erythemal ("CIE"), DNA damage ("DNA"), generalized plant response ("Plant") and SCUP-h, together with integrated UV-B (280-315 nm) and UV-A (315-400 nm) radiation. In addition, the solar noon UV index and its error estimates are stored. Attributes attached to all datasets in this group are listed in table 6. The contents of the QualityFlags and the setting of the summary flags are listed in tables 7 and 8.

Table 5. GRID_PRODUCT group contents.

Dataset name	Data type	Unit	Description
DailyDoseCie	float	kJ/m^2	Daily UV dose, CIE weighting
DailyDoseCieLow			- low dose estimate
DailyDoseCieHigh			- high dose estimate
DailyDoseDna	float	kJ/m^2	Daily UV dose, DNA damage weighting
DailyDoseDnaLow			- low dose estimate
DailyDoseDnaHigh			- high dose estimate
DailyDosePlant	float	kJ/m^2	Daily UV dose, Plant response weighting
DailyDosePlantLow			- low dose estimate
DailyDosePlantHigh			- high dose estimate
DailyDoseScuph	float	kJ/m^2	Daily UV dose, SCUP-h weighting
DailyDoseScuphLow			- low dose estimate
DailyDoseScuphHigh			- high dose estimate
DailyDoseUvb	float	kJ/m^2	Daily UV dose, integrated UV-B (280-315 nm)
DailyDoseUvbLow			- low dose estimate

Dataset name	Data type	Unit	Description
DailyDoseUvbHigh			- high dose estimate
DailyDoseUva	float	kJ/m^2	Daily UV dose, integrated UV-A (315-400 nm)
DailyDoseUvaLow			- low dose estimate
DailyDoseUvaHigh			- high dose estimate
DailyMaxDoseRateCie	float	mW/m^2	Daily maximum dose rate, CIE weighting
DailyMaxDoseRateCieLow			- low dose rate estimate
DailyMaxDoseRateCieHigh			- high dose rate estimate
DailyMaxDoseRateDna	float	mW/m^2	Daily maximum dose rate, DNA damage weighting
DailyMaxDoseRateDnaLow			- low dose rate estimate
DailyMaxDoseRateDnaHigh			- high dose rate estimate
DailyMaxDoseRatePlant	float	mW/m^2	Daily maximum dose rate, Plant response weighting
DailyMaxDoseRatePlantLow			- low dose rate estimate
DailyMaxDoseRatePlantHigh			- high dose rate estimate
DailyMaxDoseRateScuph	float	mW/m^2	Daily maximum dose rate, SCUP-h weighting
DailyMaxDoseRateScuphLow			- low dose rate estimate
DailyMaxDoseRateScuphHigh			- high dose rate estimate
DailyMaxDoseRateUvb	float	mW/m^2	Daily maximum dose rate, integrated UV-B (280-315 nm)
DailyMaxDoseRateUvbLow			- low dose rate estimate
DailyMaxDoseRateUvbHigh			- high dose rate estimate
DailyMaxDoseRateUva	float	mW/m^2	Daily maximum dose rate, integrated UV-A (315-400 nm)
DailyMaxDoseRateUvaLow			- low dose rate estimate
DailyMaxDoseRateUvaHigh			- high dose rate estimate
SolarNoonUvIndex	float	N/A	Solar noon UV index
SolarNoonUvIndexLow			- low index estimate
SolarNoonUvIndexHigh			- high index estimate
QualityFlags	int	N/A	Quality flags for the product. See table 7 for interpretation of the bits.

Table 6. Attributes for the GRID_PRODUCT group datasets.

Attribute name	Data Type	Description
Title	string	Description of the dataset, e.g. "Solar noon UV index"
Unit	string	Unit of the values in the array, e.g. second
FillValue	same as the dataset	Number in the array, if actual data value is missing
ValidRangeMin	same as the dataset	Minimum allowed value for the data in the array
ValidRangeMax	same as the dataset	Maximum allowed value for the data in the array

Table 7. Interpretation of the QualityField. Flags have the value 1 for on and 0 for off.

Bit	Name	Description
0	QC_MISSING	Data are missing. See table 8 on summary flags.
1	QC_LOW_QUALITY	At most low quality expected. See table 8 on summary flags.
2	QC_MEDIUM_QUALITY	At most medium quality expected, See table 8 on summary flags.
3	QC_INHOMOG_SURFACE	The surface UV varies too much within the grid cell because of surface inhomogenity. The flag is set if: - surface height within the grid cell deviates from the mean value more than the value InhomogeneousSurfaceHeightLimit given in the product specific metadata field (table 3). - surface albedo within the grid cell and its nearby neighbours deviates more than the value InhomogeneousSurfaceAlbedoLimit given in the product specific metadata field (table 3).
4	OC_POLAR_NIGHT	Polar night. The solar zenith angle is larger than the value PolarNightNoonSza given in the product specific metadata field (table 3).
5	QC_LOW_SUN	The Sun is too low for reliable radiative transfer modelling of surface UV. The threshold solar zenith angle is given in the LowSunNoonSza attribute of the product specific metadata field (table 3).
6	QC_OUTOFRANGE_ INPUT	Out of range input data was detected, but the value could still be used in processing.
7	QC_NO_CLOUD_DATA	No cloud data were available.
8	QC_POOR_DIURNAL_ CLOUDS	Poor diurnal cloud coverage. This flag is set when insufficient cloud data are available to cover the diurnal cloud cycle.
9	QC_THICK_CLOUDS	Thick clouds were observed. This flag is set when optically thick clouds are observed during the day. Saturation of the atmospheric reflectance as a function of the cloud optical depth prevents accurate estimation of the cloud optical depth, and therefore, the surface UV flux cannot be accurately determined. The threshold cloud optical depth is given in the ThickCloudsCod attribute of the product specific metadata field (table 3).

Bit	Name	Description
10	QC_ALB_CLIM_IN_ DYN_REG	Surface albedo climatology was used in a dynamic region where albedo varies with the snow and ice cover.
11	QC_LUT_OVERFLOW	Look-up table limits were exceeded and a value was extrapolated.
12	QC_HIGHALB_CLEARSKY	Clear-sky was assumed if surface albedo was larger than the value HighAlbedoClearSky and surface pressure was smaller than the value HighAlbedoClearSkyPatm given in the product specific metadata field.
13-15	reserved for future use	
16-19	QC_OZONE_SOURCE	4 bits as an integer: source of total column ozone data. In the current version this is always 0 meaning GOME-2 total ozone (NTO or OTO)
20-23	QC_NUM_AM_COT	4 bits as an integer: number of cloud optical thickness observations in the morning, value 15 indicating 15 or more observations.
24-27	QC_NUM_PM_COT	4 bits as an integer: number of cloud optical thickness observations in the afternoon, value 15 indicating 15 or more observations.
28-31	QC_NOON_TO_COT	4 bits as an integer: minimum time in hours (rounding towards zero) between the solar noon and the nearest cloud optical thickness (COT) observation

Table 8. Mapping of the quality flags to summary flags.

Summary flag	Summary flag is on if any of these flags is on.
QC_MISSING	QC_POLAR_NIGHT QC_NO_CLOUD_DATA
QC_LOW_QUALITY	QC_MISSING QC_LOW_SUN QC_OUTOFRANGE_INPUT QC_LUT_OVERFLOW
QC_MEDIUM_QUALITY	QC_LOW_QUALITY QC_POOR_DIURNAL_CLOUDS QC_HIGHALB_CLEARSKY QC_INHOMOG_SURFACE QC_THICK_CLOUDS QC_ALB_CLIM_IN_DYN_REG

5.2 Data Types

The data types to be used in the HDF5 files are given in the table below.

Table 9. Data types for the HDF5 files.

Data type	HDF5 predefined data type
char	H5T_STD_I8LE
short int	H5T_STD_I16LE
int	H5T_STD_I32LE
float	H5T_IEEE_F32LE
double	H5T_IEEE_F64LE
string	Fortran: H5T_FORTRAN_S1 C: H5T_C_S1

5.3 File naming convention

The file naming convention of the OUV product is shown in Figure 8.

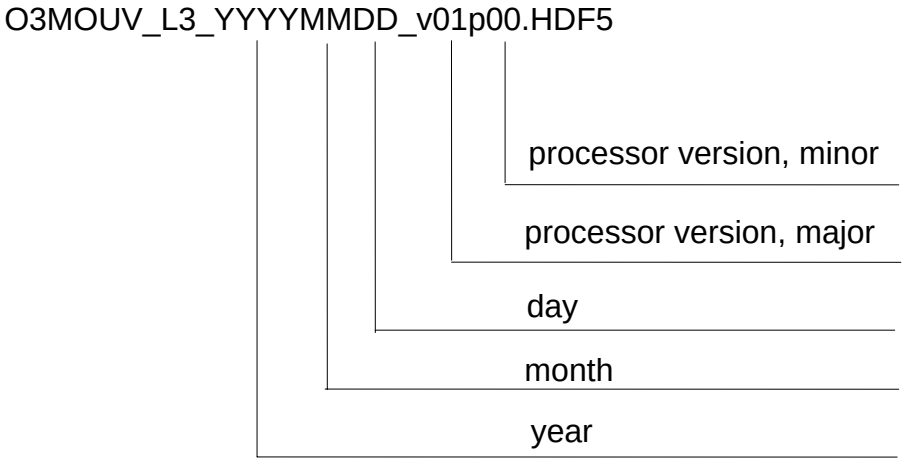

Figure 8. The structure of the OUV file name.

APPENDIX A. TRACEABILITY OF METADATA TO UMARF PARAMETERS

This appendix contains details related to the interface between the UMARF catalogue and the FMI archive. The UMARF metadata parameters [AD2] which are applicable to the O3MSAF products are stored in the HDF5 file as attributes in the Metadata group (Table 2). The tracing of UMARF parameters to the attributes in the product file is shown in the following table. The attributes can only have values which are allowed by UMARF.

UMARF Short Name	**Attribute Name**	**Notes**
ASTI	SatelliteID	-
GORT	OrbitType	-
LONS	N/A	Start Orbit Number
LONE	N/A	End Orbit Number
LLAS	N/A	SubSatellitePointStartLat
LLOS	N/A	SubSatellitePointStartLon
LLAE	N/A	SubSatellitePointEndLat
LLOE	N/A	SubSatellitePointEndLon
LSVT	N/A	Ascending Node Crossing Date and Time
OCSA	N/A	Occultation Satellite ID (TBC)
OCLA	N/A	Occultation Latitude (TBC)
OCLO	N/A	Occultation Longitude (TBC)
OCTM	N/A	Occultation Date and Time (TBC)
AIID	InstrumentID	-
SMOD	N/A	InstrumentMode
SSBT	SensingStartTime	-
SSST	SensingEndTime	-
ABID	N/A	Spectral Band IDs
GNSP	N/A	Number of Spectral Bands
RRCC	N/A	ReceivingCentre
RRBT	N/A	Reception Start Date and Time
RRST	N/A	*Ibid.* End Date and Time
PPRC	ProcessingCentre	
PPDT	N/A	Processing Start Date and Time
PPST	ProcessingTime	Processing End Date and Time
GPLV	ProcessingLevel	-

UMARF Short Name	Attribute Name	Notes
AVBA	BaseAlgorithmVersion	-
AVPA	ProductAlgorithmVersion	-
LMAP	Map Projection	-
LSCD	N/A	SpatialCoverageModel
APXS	N/A	PixelSize
SNIT	ReferenceTime	-
AENV	N/A	SourceEnvironment
GDMD	Disposition Mode	-
GPMD	ProcessingMode	-
APNM	ProductType	-
APNA	N/A	Unique product identifier used in the O3M SAF archive; not included in the product file, provided to UMARF by archive software
APPN	ParentProducts	-
APAS	Added by Archive	Product Actual Size; not included in the product file, provided to UMARF by archive software
GNPO	N/A	Native Pixel Order
GNPF	N/A	ProductFormatType
GNFV	ProductFormatVersion	-
QCCV	N/A	Cloud Coverage
QQOV	OverallQualityFlag	-
QQAI	QualityInformation	-
QDRC	DegradedRecordCount	-
QDRP	DegradedRecordPercentage	-
QDLC	MissingDataCount	-
QDLP	MissingDataPercentage	-
AARF	Added by Archive	Archive Facility; not included in the product file, provided to UMARF by archive software
UUDT	N/A	Ingestion Date and Time
GGTP	GranuleType	-
UDSP	N/A	DispositionFlag, UMARF internal